AGRI-FOOD BUSINESS OPTIMIZATION USING ARTIFICIAL INTELLIGENCE METHODS

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ABSTRACT

In this paper is proposed the use of methods specific to artificial intelligence in financial management, aiming at finding some pairs {artificial intelligence method, financial management problem} in which the results have to be optimal and better than traditional methods.

1. INTRODUCTION

Artificial Intelligence (AI) can be regarded as that part of informatics that aims to design those systems that are endowed with certain properties that we normally associate with human intelligence: language understanding, learning, reasoning, problem solving, theorems' demonstration.
Different definitions of artificial intelligence focus differently, either on cognitive processes or behavior. Thus, Artificial Intelligence can be regarded as the study of systems which:

- think like people do;
- think rationally;
- act like people do;
- act rationally.

In this paper is proposed the use of methods (paradigms) specific to artificial intelligence in financial management, aiming at finding some pairs {artificial intelligence method, financial management problem} in which the results have to be optimal and better than traditional methods.

2. EXPERT SYSTEMS

Among methods and paradigms specific to Artificial Intelligence, expert systems are most "well-known", being the first which were imposed in practice, overcome the theoretical research framework, in author's appreciation, the avant-garde character, novelty, unconventional feature of expert systems is somehow obsolete, the membership to "artificial intelligence" field being in this moment questionable.
The reasons of this chapter in the present paper, taking into consideration the innovations and the author's original contribution are significant, and are the followings:

- uniformity and minimum claim of completeness of the paper;
- design some hybrid systems, in which expert systems are a component;

In Fig.1 it is presented an expert system case used in deciding when to grant a customer credit.

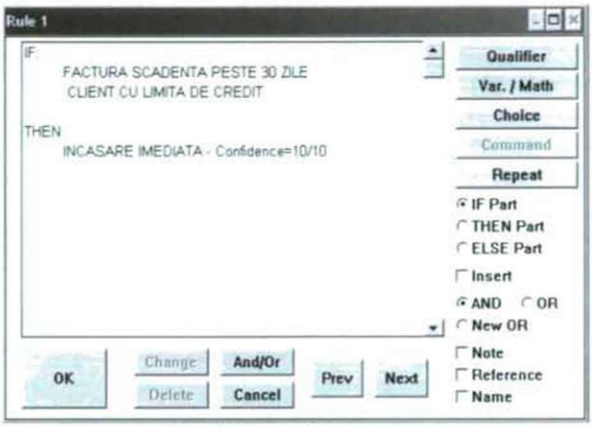

Fig.1. Input window rules.

In the category of premises one can have pieces of knowledge in the form of questions, variables, goals (if it wants to test the level reached by certainty factors). The same components are also found in conclusion category, stating that the goals are followed by a value award for certainty factor taking into consideration one of the variants specified in the control panel parameters. Control panel allows the printing as a file or directly to the printer of all parts of knowledge in a continuous or on different pages using one of three front sizes: 10, 12 or 14. Knowledge base of the prototype ANALYSIS was redirected to the file "CLIENT" from EXSYS working directory. This is presented below:

Subject:
OUTSTANDING INVOICE CUSTOMER TREATMENT

Author:
TITUS SLAVICI

Starting text:
EXSYS DEVELOPER EXPERT SYSTEMS OF MAKING DECISION OF CUSTOMER TAXES COLLETION

Ending text:
FOLLOWING EXSYS EXPERT SYSTEMS CONSULTATION IT HAS REACHED THE FOLLOWING CONCLUSIONS:

Uses all applicable rules in data derivations.
Probability System: 0 - 10

DISPLAY THRESHOLD: 2

QUALIFIERS:
1 OUTSTANDING INVOICE OVER 30 DAYS
CUSTOMER CREDIT LIMIT
BAD CUSTOMER

2 OUTSTANDING INVOICE OVER 60 DAYS
CUSTOMER CREDIT LIMIT
BAD CUSTOMER

GOALS:
1 IMMEDIATE CASH
2 SUPPLY SUSPENSION UNTIL THE COLLECTION OF OUSTANDING INVOICES

RULES:
RULE NUMBER: 1
IF:
OUTSTANDING INVOICE OVER 30 DAYS
CUSTOMER CREDIT LIMIT

THEN:
IMMEDIATE CASH - Confidence=10/10

RULE NUMBER: 2
IF:
OUTSTANDING INVOICE OVER 30 DAYS
BAD CUSTOMER

THEN:
SUPPLY SUSPENSION UNTIL THE COLLECTION OF OUSTANDING INVOICES - Confidence=9/10

RULE NUMBER: 3
IF:
OUTSTANDING INVOICE OVER 60 DAYS
CUSTOMER CREDIT LIMIT

THEN:
IMMEDIATE CASH - Confidence=8/10

RULE NUMBER: 4
IF:
OUTSTANDING INVOICE OVER 60 DAYS
BAD CUSTOMER

THEN:
SUPPLY SUSPENSION UNTIL THE COLLECTION OF OUSTANDING INVOICES - Confidence=7/10

3. ARTIFICIAL NEURAL NETWORKS

The question arises how efficient it is the use of neural networks in those types of applications that fully exploit the advantage of their specifics, obviously there are types of problems that almost perfectly folded using ANN, but other types that generate even incompatibles with them. Within this chapter were introduced basic concepts specific to use ANN, following to be repeated and developed within the present chapter together with examples and study cases related. Generally based on experience in the field can be said that ANN are used in those types of problems with the following features:

- mathematical model of the process is unknown, has too much complexity associated with insufficient accuracy (precision) and in some cases can not be determined;
- available data are incomplete in some cases, there are signals and noise disturbance (noise term can be extrapolated from technical field and in other types of economic, genetic processes, ...);
- there are a number of constraints (restrictions) applied to the process and have to be optimized simultaneously.

ANN Application for predicting stock market shares Nikko System
In the present paragraph is presented one of the most successful uses of ANN, the author's contribution is resumed to the data processing performed by ANN implementations in Matlab tool. The reason of application processing from bibliographic sources cited in the context of this paper is to illustrate a first example of data organizing with the aim of ANN use.

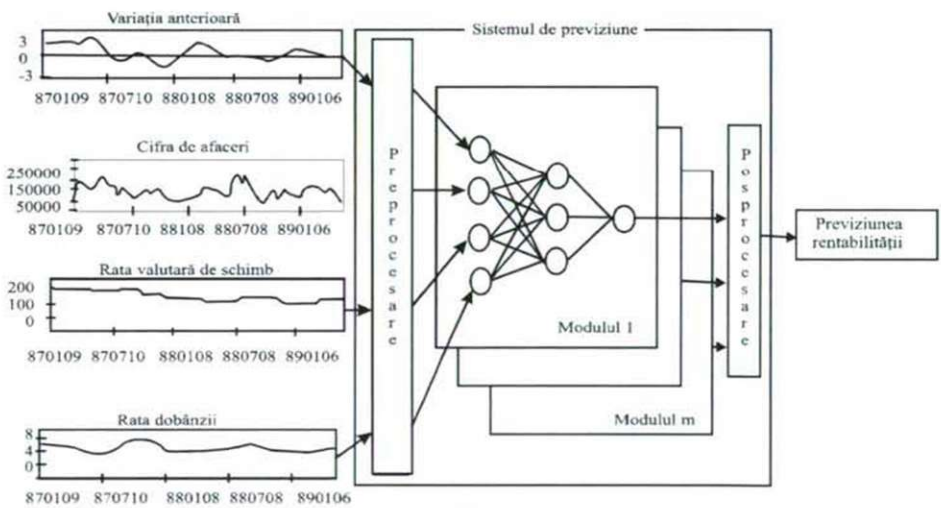

Fig.2. ANN structure.

4. OPTIMIZATING THE PORTFOLIO MANAGEMENT OF FINANCIAL SECURITIES USING FUZZY SYSTEMS.

For proposed optimizing that will be developed in this paragraph two input variables are considered:

X - tendency of financial securities;
Y - the volatility of financial securities;
and an output variable
Z - position adopted in business.

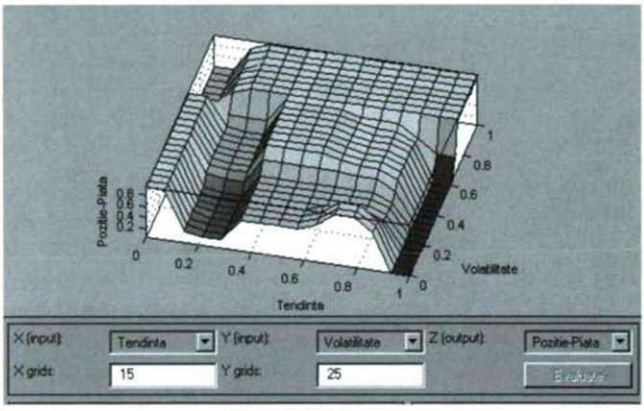

Fig.3. ANN structure.

5. GENETIC ALGORITHMS AND EVOLUTIONARY COMPUTATION

Opportunities to use genetic algorithms in classification operations, with applications in securities managing portfolio.

The problem of systems classification with GA aid is one of the most exciting applications GA, the power of this technique is extraordinary.

It is considered the example of a managing equity portfolio system; decisions taken are related to stakes that are appropriate to be sold and to be bought, obviously those decisions will be taken according to several criteria specified in the first line of the next table. In assessing inputs are used three codes, namely 1 for the situation acceptable from the point of view of that criterion, 0 unacceptable situation and # signifies irrelevance according to considered criterion.

Table. 1.

Criterion	Ex1	Ex2	Ex3
Tendency of share value	1	1	#
Issuer representativeness	#	#	1
Stock institution representativeness	#	#	#
Dividend growth tendency	#	#	#
Leverage factor	1	1	#
.....			
Purchasing decision	1	1	0
Sale decision	0	0	1

In case of outputs there are only two codes corresponding to validation option for purchasing, respectively for sale, for the first example is considered, reaching the conclusion that the purchase is appropriate.

6. DISCUSSION AND CONCLUSION

In certain situations, for example the use of artificial neural networks, has been found an exceptional applicability of those in economic field, fitting in the specifics of the economic data and processes: mathematical models of many economic processes have a high complexity associated with an insufficient accuracy and that available data are incomplete in many cases, there are disturbing signals, so for example: Percentage accuracy predictions of companies' bankruptcy were 93-97% higher than those obtained by traditional methods.
In other situations, for example in genetic algorithms case has been found a less efficient application of those in financial field; however their specific techniques could be used in case of some hybrid intelligent systems, helping to optimize other specific artificial intelligence methods.
In case fuzzy expert systems and expert one the results were relatively good, those being improved by their inclusion within hybrid systems.

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